Population-Based Surveillance of Infectious Diseases in Private Hospitals in Damanhour District, Egypt

Background

Infectious diseases, such as tuberculosis, lower respiratory infections and diarrheal diseases, continue to be a leading killer accounting for 25.4% of worldwide deaths[1]. With the substantial amount of international travel, the global food industry and with the coalescence of populations, these infectious agents have the potential to spread rapidly around the world[2]. Disease surveillance systems are critical to control the spread of infectious diseases. Active surveillance of emerging infections allows for the implementation of controls while ongoing surveillance of routine diseases influences vaccination, prophylaxis, and control measures[3].

Literature pertaining to the burden of infectious diseases in the Middle East and North African Region is limited. Short surveillance studies in Egypt have found typhoid fever and brucellosis to be the most common causes of acute febrile illness[4], and among children in the region rotavirus is the leading cause of diarrheal mortality (as is the case in most developing countries)[5,6]. In fact, rotavirus infections cost Israel roughly $4.59 million per year in direct medical costs and another $1.95 million in indirect costs[4]. By these figures, the burden of disease is significant, but there is little evidence of a comprehensive burden of diseases in the area.

Few laboratories in this region have the capability to confirm etiologies of the infectious diseases[7]. Damanhour, Egypt, the capital of the Beheira Governorate, established an active surveillance system in December of 2009 to detect acute respiratory infection, acute infectious neurological disease, acute febrile illness, acute diarrheal infection and tuberculosis from the public hospitals. Egypt is an ideal location to institute surveillance because the under 5 mortality is 23 per 1000 live births[8] and the adult mortality is 239 and 158 per 1000 for males and females, respectively[9]; a substantial amount of these deaths is attributed to infectious diseases.

For the first time, this region of the world has the capabilities to test for a wide array of pathogens and syndromes with the goals of identifying the etiologies and of controlling outbreaks of emerging infectious diseases. The current data were collected from public hospitals, but there has yet to be data collection from private hospitals. Preliminary data from the surveillance system indicate that little over 70% of patients presenting with influenza-like illness are influenza positive by rt-PCR (CDC unpublished data). With such valuable results, the surveillance system is clearly effective for monitoring outbreaks and can even begin to influence vaccination policy.

Again, these results were obtained from the public sector. The decision to seek care in a private or public hospital depends on several factors. The public

facilities in rural areas tend to be of poor quality so residents will opt for a private facility, if affordable. Egyptian health insurance covers services at public facilities, yet 41% of people still choose private facilities[10]. Those living in extreme poverty often turn first to traditional and "magical" healers. There is variability in care sought, but with such a high percentage of the population seeking private care, the next installation of the surveillance system needs to assess the burden of infectious diseases presenting at private facilities.

Previous surveillance studies in other regions of Egypt successfully identified etiologies of infectious diseases with the proper laboratory equipment[11],[12]. Since the Damanhour site now has this capacity, implementing the surveillance system in private hospitals would help strengthen existing efforts and lessen gaps in the system. A more thorough approach to monitoring active infections will reduce the burden and spread of disease in the Damanhour District. This system will provide early warnings of outbreaks in the region that may spread outside of Egypt; identifying infections before they spread will have potential global benefits.

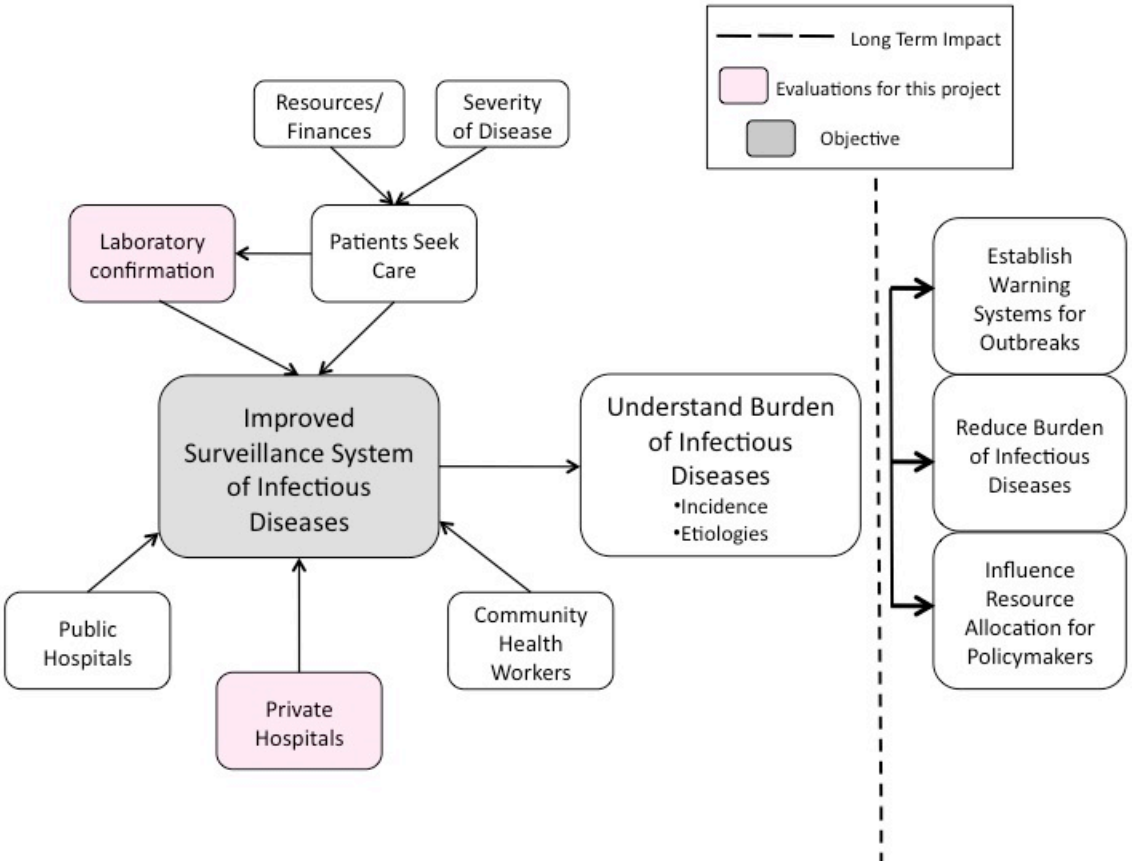
Objective

- To determine the incidence of infectious diseases in private hospitals in the Damanhour District, Beheira Governorate, Egypt

Specific Aims

1. To elaborate on the current surveillance system by conducting active surveillance in the private hospitals
2. To quantify infections in the region identified in private hospitals
3. To determine etiologies using laboratory-enhanced confirmation

Conceptual Framework



This portion of the larger surveillance project is to improve the established system by integrating data collected from private hospitals. Those admitted to the private hospitals with suspected infectious diseases will be tested and confirmed biologically (with advanced laboratory confirmation). The factors that are necessary to strengthen the surveillance system are listed on top and from where the data collection will and should occur are listed below the objective. The immediate outcome, to understand the burden of infectious diseases, prompts the need for improved surveillance. The long-term impact of this project is the reduced burden of infectious diseases in the region, though this is outside the scope of a summer project.

Methods

Research Design

A cross-sectional, quantitative approach will determine the incidence of infectious diseases in the area. Data was collected from the public hospitals using a comprehensive survey. To strengthen this existing surveillance system, data from private hospitals will be collected in the same manner using the same questionnaire. This will ensure consistency of data collection among the public and private hospitals and is an appropriate way to compile quantitative information from a large population for data analysis. Then, based on the surveys and a physician consult, select patients will be enrolled to provide, with consent, samples to be tested in order to quantify infections and determine the etiologies of the diseases. Like in the public hospitals, advanced laboratory techniques will be used for the biological confirmation to accurately determine the incidence of particular infectious diseases.

Larger project:

The surveillance system was recently established in the Damanhour district in the Beheira Governorate, Egypt. This system identifies infectious diseases in the district and the etiologies of these diseases using laboratory-enhanced methods. In a collaborated effort between the Egyptian Ministry of Heath, the Centers for Disease Control and Prevention, and the United States Naval Medical Research Unit #3 (NAMRU-3), the region has the capabilities to detect infectious agents affecting the population. The ultimate goal of this larger project is to detect infectious disease threats of public health importance, influence policymakers when considering the allocation of funding and/or resources, and to reduce the burden of infectious diseases. The portion of the project incorporating private hospitals is contributing to the preexisting, on-going efforts.

Project site and population:

Egypt is divided into 29 administrative regions, or governorates. The Damanhour district is located within the Beheira governorate and has a population of 691,000. This district contains the main urban city, Damanhour city, and a large rural area. The northern Egyptian district is located in Nile Delta Region and contains 14 hospitals, 8 of which are public and 6 of which are private. The private hospitals are Dar el Shefa, El Mobara, The Medical Center, El Raee el Saleh, Dar el Salam and El Masry.

There is very little exclusion in the study population. Because this project is a population-based surveillance, all individuals will be included regardless of ethnicity, socioeconomic status, religion, or sex. Neonates (less than 31 days old) will be excluded, as many of their infections are acquired during passage through the birth canal and are not representative of the incidence of infectious diseases being monitored. Case definitions vary between children under 5 years and children/adults over the age of 5 years, but there is no upper age limit for inclusion.

Project Procedures:

The larger project, started in public hospitals December 2009, initiated the surveillance protocol in increments due to the nature of the project; a large region with a broad scope of diseases being investigated. Disease syndromes were introduced in a

stepwise manner, first with respiratory diseases followed by out-patient influenza-like illnesses and TB, diarrheal diseases, acute febrile illness and lastly, acute infectious neurological disease. It took one year for the complete surveillance system to be functional within all 8 public hospitals. With this solid infrastructure in place, the establishment of the surveillance in private hospitals should only take 3-4 weeks, with consistent reporting by one month.

When patients seek care for any of the above listed illnesses, the study nurses will provide the patients with a comprehensive survey (upon discharge) addressing risk factors associated with disease syndromes, potential exposures, demographic information, date of onset of symptoms, hospitalizations and final outcome. These surveys will be constructed in EpiInfo and the information will be collected using a password-protected Personal Digital Assistant (PDA), just as was done in the public hospitals. A physician consult will determine if the patient presents with symptoms meeting the specific case definitions for each syndrome. If so, with consent, those patients meeting the case definition will submit the required samples (stool, sputum, urine, nasopharyngeal swab, oropharyngeal swab, etc.) for laboratory testing. These samples will be labeled with a unique identification number to be used on all forms and specimens for that patient for the remainder of the surveillance period.

Once the samples are collected and properly labeled and stored, the project staff will transport the specimens to NAMRU-3, the research lab, and analyze the samples in the laboratory. Depending on the agent or illness being tested, different techniques will be applied, including but not limited to: polymerase chain reaction (PCR), real-time PCR, blood and bacterial culture and microscopic observation drug susceptibility testing.

The sample size comprises all those who seek care and meet the specific case definitions established previously within the larger project. Based on prior calculations from the public hospitals, the expected enrollment is 21 cases per month per hospital. For the three-month portion at the six private hospitals, 378 patients are expected to enroll.

The measurement in this project is the incidence of infectious diseases in the area. The first instrument is the survey explained above. Data from that survey will be downloaded daily from the PDAs and will then be analyzed using SPSS. The associations investigated will be that of exposure and different infectious diseases and the analysis will also reveal how many of the perceived infections (those who sought care) were actually diagnostically confirmed. The second instrument in this project is the laboratory equipment. The use of the laboratory will provide the accurate, quantifiable amount of infectious diseases in the area.

The final product of this portion of the project will describe the incidence of infectious diseases in the Damanhour district in the Beheira governorate, Egypt. The project will establish surveillance in the private hospitals that will then be maintained by permanent research staff in Egypt. The immediate results will quantify the incidence of infections in reports and peer-reviewed articles. The long-term deliverable of this surveillance system (in terms of the larger project) is to introduce interventions and

control measures for the spread of infectious diseases within the Damanhour district and within the country. A limitation of this study is the assumption that patients are going to the hospital seeking care when ill from the broad spectrum of infectious agents.

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